Encyclopedia of Law & Society: American and Global Perspectives

Multivariate Analysis

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Book Title: Encyclopedia of Law & Society: American and Global Perspectives
Chapter Title: "Multivariate Analysis"
Pub. Date: 2007
Access Date: November 25, 2020
Publishing Company: Sage Publications, Inc.
City: Thousand Oaks
Print ISBN: 9780761923879
Online ISBN: 9781412952637
DOI: http://dx.doi.org/10.4135/9781412952637.n481
Print pages: 1048-1049

In statistics, the term multivariate analysis applies to a wide and divergent set of statistical tools. In the most general terms, multivariate analysis involves the study of more than one dependent variable simultaneously. The most common statistical tool used in legal scholarship, multiple regression, technically would not fit under the heading of multivariate analysis because regression techniques generally focus on examining the determinants of a single dependent variable.

However, some advanced regression techniques are multivariate. For example, in instances in which two or more dependent variables are thought to be related (for example, law students' grade point averages and their likelihood of passing the bar exam), multivariate regression or seemingly unrelated regression techniques exploit the covariance between the outcome variables. This allows a researcher to test whether a given independent variable is a jointly significant determinant of the two measures of success. These methods also allow researchers to test whether the marginal effect of a given independent variable is equal across the two outcome measures.

Estimating systems of equations or performing instrumental variables techniques are also forms of multivariate analysis. These methods allow for the possibility that not all independent variables are exogenous. That is, they allow for the possibility that the dependent variable influences the value of one or more of the independent variables. Failing to control for this possibility could lead to mistaken causal inferences. Instead of the standard interpretation that the independent variables determine the dependent variable, the correct interpretation might be that the causal mechanism runs in the opposite direction or that some uncontrolled variable actually influences both the dependent and the independent variables. In simultaneous equation systems or in instrumental variables analysis, researchers actually model the independent variables as being a function of a set of instruments that do not directly affect the dependent variable of interest, allowing researchers to have more confidence in their causal inferences.

More-sophisticated models that control for the endogeneity problem described above, particularly the problem of self-selection, attempt to model the likelihood that a potential observation shows up in the data set under study based on a latent or unobserved decision rule that a researcher attempts to recreate with observed variables.

Another multivariate method that has taken on added importance with the emergence of panel data analyses is cluster analysis. Cluster analysis attempts to discern the natural groupings of observations in a data set. For regression analysis, knowing the natural groupings assists researchers in controlling for correlations among the observations in a given group within the full data set, usually inducing them to allow for correlation of errors within groups but independence among observations across groups.

Scholars have employed other multivariate methods in the social sciences but they have not made significant inroads into empirical legal scholarship. These methods include discriminant analysis, factor analysis, hierarchical models, principal components analysis, and canonical correlation, among others.

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http://dx.doi.org/10.4135/9781412952637.n481
See also

- Causal Inference
- Databases
- Economic Models
- Empirical Research Strategies
- Factor Analysis
- Mathematical Modeling
- Prediction Studies
- Statistical Inference

Further Readings

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